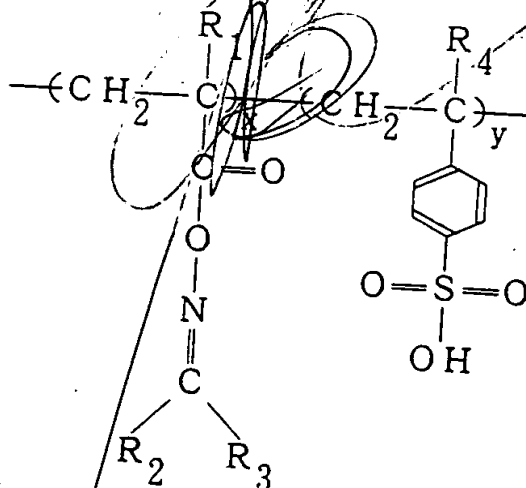


cm WHAT IS CLAIMED IS:

5 1. A pattern forming material comprising a copolymer including a first group for generating a base through irradiation with an energy beam and a second group having an acidic property.

2. The pattern forming material of Claim 1, wherein said second group is a group including a sulfonic acid group.

10 3. The pattern forming material of Claim 1, wherein said copolymer is a binary copolymer represented by the following general formula or a ternary or higher copolymer obtained by further polymerizing said binary copolymer with another group:



15 wherein  $R_1$  indicates a hydrogen atom or an alkyl group;  $R_2$  and  $R_3$  independently indicate a hydrogen atom, an alkyl group,

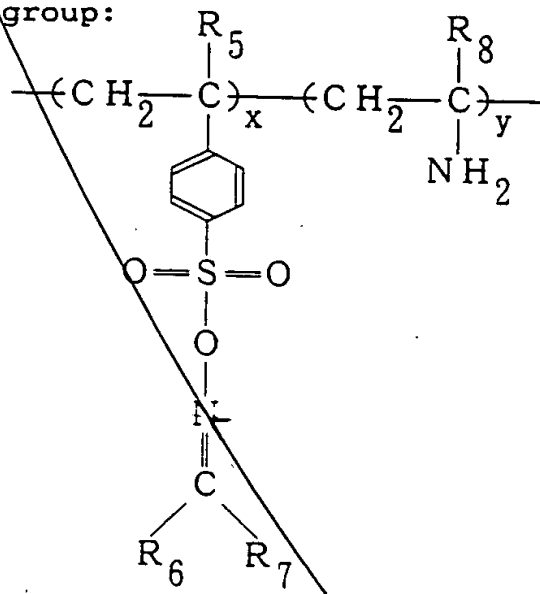
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a phenyl group or an alkenyl group, or together indicate a cyclic alkyl group, a cyclic alkenyl group, a cyclic alkyl group having a phenyl group or a cyclic alkenyl group having a phenyl group; R<sub>1</sub> indicates a hydrogen atom or an alkyl group; x satisfies a relationship of  $0 < x < 1$ ; and y satisfies a relationship of  $0 < y < 1$ .

4. A pattern forming material comprising a copolymer including a first group for generating an acid through irradiation with an energy beam and a second group having a basic property.

5. The pattern forming material of Claim 4, wherein said first group is a group for generating sulfonic acid.

6. The pattern forming material of Claim 4, wherein said copolymer is a binary copolymer represented by the following general formula or a ternary or higher copolymer obtained by further polymerizing said binary copolymer with another group:



wherein  $R_5$  indicates a hydrogen atom or an alkyl group;  $R_6$  and  $R_7$  independently indicate a hydrogen atom, an alkyl group, a phenyl group or an alkenyl group, or together indicate a cyclic alkyl group, a cyclic alkenyl group, a cyclic alkyl group having a phenyl group or a cyclic alkenyl group having a phenyl group;  $R_8$  indicates a hydrogen atom or an alkyl group;  $x$  satisfies a relationship of  $0 < x < 1$ ; and  $y$  satisfies a relationship of  $0 < y < 1$ .

7. A pattern forming material comprising a copolymer including:

a first group for generating an acid through irradiation with a first energy beam having a first energy band; and

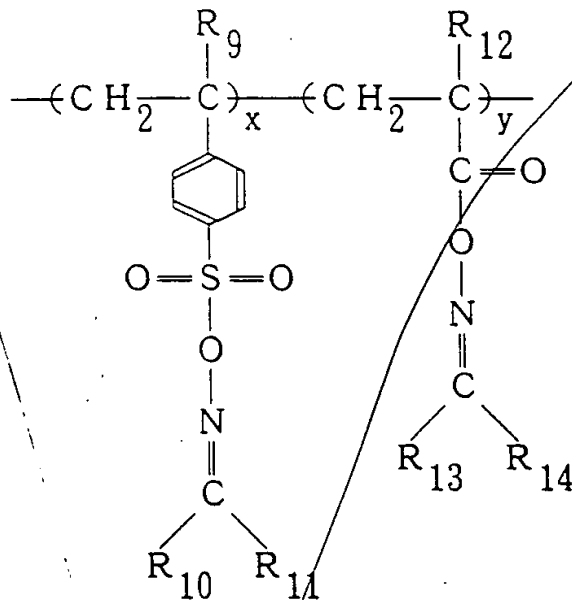
a second group for generating a base through irradiation with a second energy beam having a second energy band different from said first energy band.

8. The pattern forming material of Claim 7,

wherein said first group is a group for generating sulfonic acid.

9. The pattern forming material of Claim 7,

wherein said copolymer is a binary copolymer represented by the following general formula or a ternary or higher copolymer obtained by further polymerizing said binary copolymer with another group:



wherein  $\text{R}_9$  indicates a hydrogen atom or an alkyl group;  $\text{R}_{10}$  and  $\text{R}_{11}$  independently indicate a hydrogen atom, an alkyl group, a phenyl group or an alkenyl group, or together indicate a cyclic alkyl group, a cyclic alkenyl group, a cyclic alkyl group having a phenyl group or a cyclic alkenyl group having a phenyl group;  $\text{R}_{12}$  indicates a hydrogen atom or an alkyl group;  $\text{R}_{13}$  and  $\text{R}_{14}$  independently indicate a hydrogen atom, an alkyl group, a phenyl group or an alkenyl group, or together indicate a cyclic alkyl group, a cyclic alkenyl group, a cyclic alkyl group having a phenyl group or a cyclic alkenyl group having a phenyl group;  $x$  satisfies a relationship of  $0 < x < 1$ ; and  $y$  satisfies a relationship of  $0 < y < 1$ .

10. A pattern forming method comprising:

a first step of forming a resist film by coating a semiconductor substrate with a pattern forming material including a copolymer having a first group for generating a

base through irradiation with an energy beam and a second group having an acidic property;

a second step of selectively irradiating said resist film with said energy beam by using a mask having a desired pattern, generating said base in an exposed area on said resist film and neutralizing said generated base with said second group;

a third step of supplying metal alkoxide onto said resist film and forming a metal oxide film on a surface of an unexposed area on said resist film; and

a fourth step of forming a resist pattern by dry-etching said resist film by using said metal oxide film as a mask.

11. The pattern forming method of Claim 10,

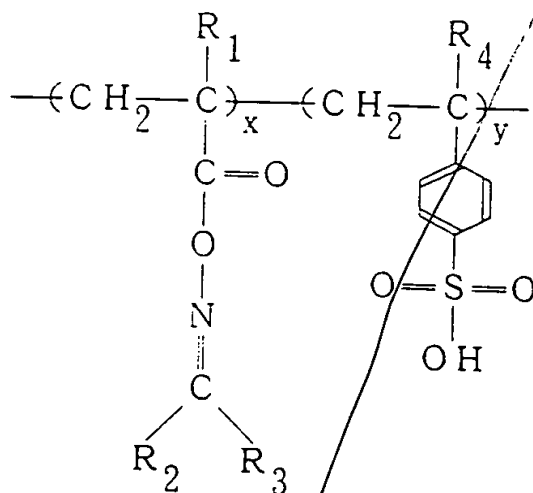
wherein said third step includes a step of allowing said unexposed area on said resist film to adsorb water.

12. The pattern forming method of Claim 10,

wherein said second group is a group including a sulfonic acid group.

13. The pattern forming method of Claim 10,

wherein said copolymer is a binary copolymer represented by the following general formula or a ternary or higher copolymer obtained by further polymerizing said binary copolymer with another group:



wherein  $\text{R}_1$  indicates a hydrogen atom or an alkyl group;  $\text{R}_2$  and  $\text{R}_3$  independently indicate a hydrogen atom, an alkyl group, a phenyl group or an alkenyl group, or together indicate a cyclic alkyl group, a cyclic alkenyl group, a cyclic alkyl group having a phenyl group or a cyclic alkenyl group having a phenyl group;  $\text{R}_4$  indicates a hydrogen atom or an alkyl group;  $x$  satisfies a relationship of  $0 < x < 1$ ; and  $y$  satisfies a relationship of  $0 < y < 1$ .

14. A pattern forming method comprising:

a first step of forming a resist film by coating a semiconductor substrate with a pattern forming material including a copolymer having a first group for generating an acid through irradiation with an energy beam and a second group having a basic property;

a second step of selectively irradiating said resist film with said energy beam by using a mask having a desired pattern, generating said acid in an exposed area on said resist film and

neutralizing said generated acid with said second group;

a third step of supplying metal alkoxide onto said resist film and forming a metal oxide film on a surface of an unexposed area on said resist film; and

a fourth step of forming a resist pattern by dry-etching said resist film by using said metal oxide film as a mask.

15. The pattern forming method of Claim 14,

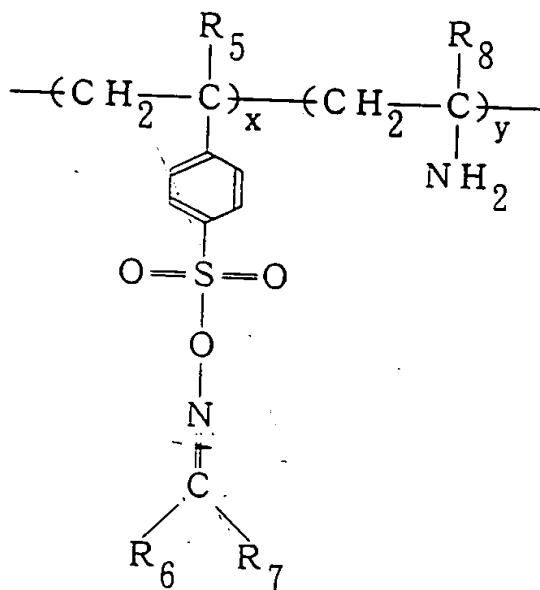
wherein said third step includes a step of allowing said unexposed area on said resist film to adsorb water.

16. The pattern forming method of Claim 14,

wherein said first group is a group for generating sulfonic acid.

17. The pattern forming method of Claim 14,

wherein said copolymer is a binary copolymer represented by the following general formula or a ternary or higher copolymer obtained by further polymerizing said binary copolymer with another group:



wherein  $R_1$  indicates a hydrogen atom or an alkyl group;  $R_2$  and  $R_3$  independently indicate a hydrogen atom, an alkyl group, a phenyl group or an alkenyl group, or together indicate a cyclic alkyl group, a cyclic alkenyl group, a cyclic alkyl group having a phenyl group or a cyclic alkenyl group having a phenyl group;  $R_4$  indicates a hydrogen atom or an alkyl group;  $x$  satisfies a relationship of  $0 < x < 1$ ; and  $y$  satisfies a relationship of  $0 < y < 1$ .

18. A pattern forming method comprising:

a first step of forming a resist film by coating a semiconductor substrate with a pattern forming material including a copolymer having a first group for generating an acid through irradiation with a first energy beam having a first energy band and a second group for generating a base through irradiation with a second energy beam having a second energy band different from said first energy band;

a second step of selectively irradiating said resist film with said first energy beam by using a mask having a desired pattern, and generating said acid in an exposed area of said first energy beam on said resist film;

a third step of irradiating an entire surface of said resist film with said second energy beam, generating said base on the entire surface of said resist film, and neutralizing said generated base with said acid generated in said exposed area of said first energy beam on said resist film;

a fourth step of supplying metal alkoxide onto said resist film and forming a metal oxide film on a surface of an



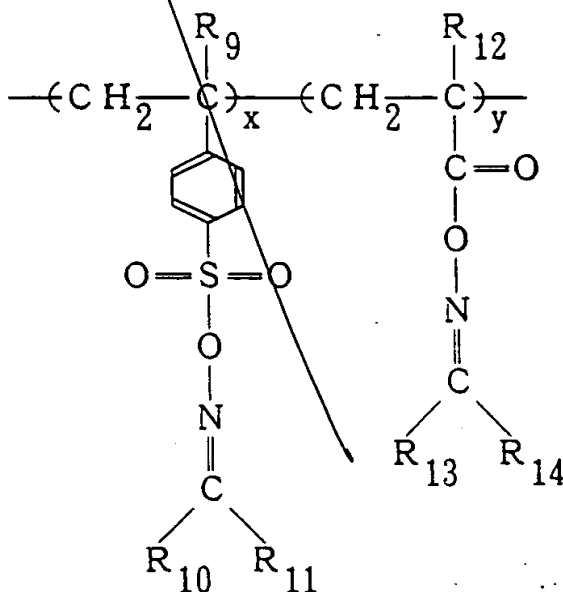
unexposed area of said first energy beam on said resist film;  
and

a fifth step of forming a resist pattern by dry-etching  
said resist film by using said metal oxide film as a mask.

5 19. The pattern forming method of Claim 18,  
wherein said first group is a group for generating  
sulfonic acid.

20. The pattern forming method of Claim 18,  
wherein said fourth step includes a step of allowing said  
10 unexposed area on said resist film to adsorb water.

21. The pattern forming method of Claim 18,  
wherein said copolymer is a binary copolymer represented  
by the following general formula or a ternary or higher  
copolymer obtained by further polymerizing said binary  
15 copolymer with another group:



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wherein  $R_9$  indicates a hydrogen atom or an alkyl group;  $R_{10}$  and  $R_{11}$  independently indicate a hydrogen atom, an alkyl group, a phenyl group or an alkenyl group, or together indicate a cyclic alkyl group, a cyclic alkenyl group, a cyclic alkyl group having a phenyl group or a cyclic alkenyl group having a phenyl group;  $R_{12}$  indicates a hydrogen atom or an alkyl group;  $R_{13}$  and  $R_{14}$  independently indicate a hydrogen atom, an alkyl group, a phenyl group or an alkenyl group, or together indicate a cyclic alkyl group, a cyclic alkenyl group, a cyclic alkyl group having a phenyl group or a cyclic alkenyl group having a phenyl group;  $x$  satisfies a relationship of  $0 < x < 1$ ; and  $y$  satisfies a relationship of  $0 < y < 1$ .

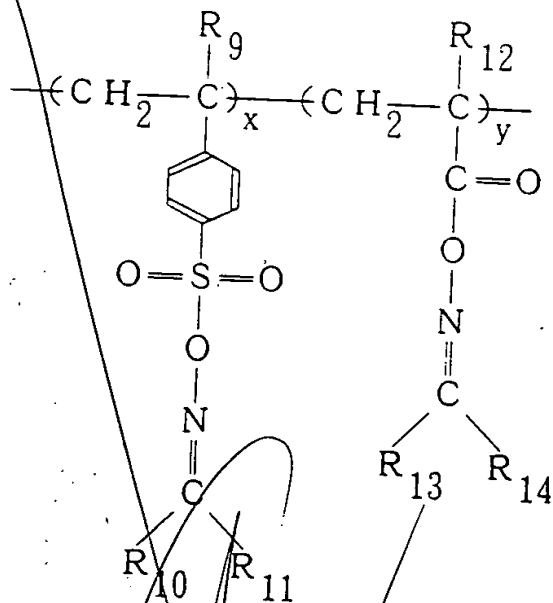
22. A pattern forming method comprising:

a first step of forming a resist film by coating a semiconductor substrate with a pattern forming material including a copolymer having a first group for generating a base through irradiation with a first energy beam having a first energy band and a second group for generating an acid through irradiation with a second energy beam having a second energy band different from said first energy band;

a second step of selectively irradiating said resist film with said first energy beam by using a mask having a desired pattern, and generating said base in an exposed area of said first energy beam on said resist film;

a third step of irradiating an entire surface of said resist film with said second energy beam, generating said acid on the entire surface of said resist film, and neutralizing





wherein  $\text{R}_9$  indicates a hydrogen atom or an alkyl group;  $\text{R}_{10}$  and  $\text{R}_{11}$  independently indicate a hydrogen atom, an alkyl group, a phenyl group or an alkenyl group, or together indicate a cyclic alkyl group, a cyclic alkenyl group, a cyclic alkyl group having a phenyl group or a cyclic alkenyl group having a phenyl group;  $\text{R}_{12}$  indicates a hydrogen atom or an alkyl group;  $\text{R}_{13}$  and  $\text{R}_{14}$  independently indicate a hydrogen atom, an alkyl group, a phenyl group or an alkenyl group, or together indicate a cyclic alkyl group, a cyclic alkenyl group, a cyclic alkyl group having a phenyl group or a cyclic alkenyl group having a phenyl group;  $x$  satisfies a relationship of  $0 < x < 1$ ; and  $y$  satisfies a relationship of  $0 < y < 1$ .